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AFRD newsletter *December 2013*

Fernando Sannibale Among the New APS Fellows

The newest group of Fellows of the American Physical Society includes Fernando Sannibale from the ALS Accelerator Physics Group in AFRD. Fernando was honored for "contributions to the understanding of coherent synchrotron radiation in storage rings and the development of high brightness electron beam sources."

Before coming to LBNL Fernando worked at Frascati, where he was one of the key members of the team that designed, built, and commissioned the DAFNE ϕ-Factory.

Fernando Sannibale together with John Byrd and Michael Martin (ALS) led a series of studies that has largely shaped our understanding and exploitation of the generation of coherent synchrotron radiation (CSR) in storage rings.

The resulting model allows for the design of storage rings optimized for the production of CSR.

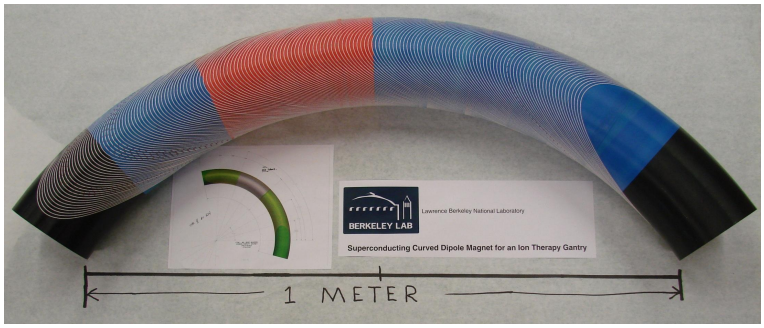
His work on understanding the generation of coherent synchrotron radiation is impressive; yet his work on high brightness, high repetition rate electron sources may have even wider ranging impacts. This is particularly true of APEX (Advanced Photoinjector EXperiment). Fernando, together with John Staples, proposed a new high brightness, high repetition rate injector scheme. This scheme is different than other concepts in that it uses a relatively low 200 MHz repetition rate. This allows it to operate in continuous wave mode, which generated enormous excitement in the free electron laser (FEL) community.

Fernando leads the APEX team, which has developed and tested the photoinjector. This is a high profile project, critical for the development of the next generation of very high repetition rate X-ray free-electron lasers and for X-ray free-electron laser oscillators. Its success opens the way to free-electron lasers of high average brightness, and radiation pulses of extremely short duration or very small line-width.

In addition to APEX, Fernando has also built two other novel electron injectors. He constructed a unique facility called the DAFNE Beam Test Facility (BTF), a beamline optimized for the generation, on a statistical basis, of "bunches" with a single electron or positron for high energy physics calibration purposes. The first of its kind and the only dedicated facility in operation for this purpose, the beam line is widely used for detector calibration. Fernando, together with Max Zolotorev, also constructed an electron source called DEGAS (DEGenerate Advanced Source) designed to approach the brightness quantum limit.

Canted-Cosine-Theta Magnet

A Canted-Cosine-Theta (CCT) magnet superposes fields of nested and tilted solenoids that are oppositely canted. The current distribution of any canted layer generates a pure harmonic field as well as a solenoid field that can be cancelled with a similar but oppositely canted layer.



The concept places windings within a mandrel's ribs and spars that simultaneously intercept and guide the Lorentz forces from each turn to prevent stress accumulation.

Compared to other design,s the need for pre-stress in this concept is reduced by an order of magnitude, making it highly compatible with strain-sensitive superconductors such as Nb_3Sn or HTS. Intercepting large Lorentz forces is of particular interest in magnets with large bores and high field accelerator magnets like the ones needed in the future High Energy upgrade of the LHC.

The Superconducting Magnet Group at LBNL has recently built and tested a two layer CCT1 as a proof of principle. The two layer magnet reached its expected field of 2.5 T with a field quality close to what is required in accelerator magnets. The design has now been extended to a field over 10 T with an ultimate goal of 20 T.

The idea was introduced in a Lab Directed R&D project; it was a candidate design for a 90 degree curved dipole magnet for a heavy-ion cancer therapy accelerator's carbon-beam gantry.

Get to Know Your Colleague: Alex Ratti

What's your name? How do you pronounce it (unless it's obvious)? Do you usually go by a nickname or an anglicized version of your name?

Alessandro (not Allesandro, Allessandro, Alejandro, Alexander, or any other combination). To avoid the problem, I quickly became Alex.

What is your current position and what are you working on right now?

I have many jobs and spend 50% of my time coordinating the US contribution to the Crab Cavity project, a potential $30M project to upgrade the LHC. Another 50% goes to seeking new initiatives to keep our groups thriving: with my friends in AFRD we met in the last few weeks with representatives from China, the Czech Republic, Kazakhstan and Brazil. Add 30% to coordinate the LBNL contribution to the LARP program. And another 19.6% to help with the design of the LCLS2 linac.

Have you done other things at the Lab prior to your current activites?

When I first joined the Lab, I became the electronics group for a new initiative, the injector for the Spallation Neutron Source in Oak Ridge. After a few months of helping everyone putting the proposal together, I found myself leading the engineering planning of the LBNL contribution to the CD-2 "Lehman" project review. After this, I ended up taking over the responsibility for the construction of the luminosity monitor for the LHC. I was also appointed US coordinator of instrumentation contributions to the LHC.

In between some of these accelerator activities, about ten years ago we started a collaboration with a few really cool geophysicists. This resulted in BUD (the Berkeley Unexploded ordnance Discriminator). We're now trying to apply it to the discovery of water in agricultural areas in the third world in collaboration with the LIGTT. *Editor's note: The Lab's LIGTT program is described at* `http://newscenter.lbl.gov/news-releases/2012/02/08/ligtt/`

What is your professional background? Where did you work before coming to the Lab?

Right after defending my thesis, I took a job at Brookhaven and worked on the AGS booster and RHIC. While my role was the design and construction of the accelerating system for the collider, I had also developed a reputation for measurements and ended up helping with coupling impedance studies (stretched wire measurements) of the most critical components in the ring, starting from the kickers (meeting Glen Lambertson was one of the highlights of this activity).

Where are you from originally? Where did you go to college or university?

I was born by chance in the USA, but my parents moved back to Italy when I was 2 months old. I was raised in northern Italy, in Pavia, home of the second oldest university in Italy, dating back > 1000 years. I have an EE degree from the Universita' di Pavia. My thesis was on the warm model of the superconducting RF cavities for the ALPI heavy ion linac that eventually was built at the Italian national lab in Legnaro, near Padua. I also have an MBA from Cal.

With which scientist (past or present) would you like to discuss their work?

Alice Waters, although she's also an artist.

Calendar

December 20th	12:00-1:30	71-264	CBP/LOASIS Holiday Potluck
January 13th	1:30am-1:30pm	7-211	BLAZES Volunteer Training (registration required)

Link of the Month: Implicit Association Test

If you have been to Paul Alivisatos' last all-hands meeting, you have heard about this: We all have implicit biases, but we might not be aware of them. Harvard has put together online tests you can try for yourself to see if you have implicit biases. Each test takes about 10 minutes. The tests can be found at `https://implicit.harvard.edu/implicit/`

Thanks to David Robin for material on Fernando Sannibale's career, Soren Prestemon and Shlomo Caspi for material on the new magnet, and Alex Ratti for "Get to Know Your Colleague". Thanks to Joe Chew, Steve Gourlay, Peter Seidl, and Sam Vanecek for editing/proofreading.